



February 17, 2006

Dan Landon, Executive Director, NCTC
 101 Providence Mine Rd, Suite 102
 Nevada City, CA 95959

RE: Roundabout Analysis at Idaho Maryland and E. Main St.

Dear Dan:

In an effort to further refine the roundabout analysis, I have prepared this second addendum to address additional comments from Caltrans concerning the VISSIM roundabout analysis. Specifically, it was requested that:

- 30 second intervals be used in the micro-simulation to better track platoons onto the ramp, etc.
- Crosswalks be added with a low level of pedestrians accessing the crosswalks (we used 10 pedestrians on each of the three crosswalks added for a total of 30 pedestrians in this scenario).
- High volume in ramp count be thrown out as an anomaly.
- Adjust yield line for bypass lane back to match yield line for southbound approach lane.

We used the same traffic count data reported in the first addendum, specifically, to use a 2% growth rate applied to the August 28, 2002 PRISM count for 10 years growth to determine a "Year 2012" volume. Table 1 shows the Year 2002 and 2012 growth projection from the PRISM count using a 2% growth rate at the Idaho Maryland/E. Main intersection. It should be noted that the NCTC traffic model has a growth rate of only 1.5%/yr in the same vicinity.

Table 1

Idaho Maryland			SR 20/49 Offramp			E. Main St.			E. Main St.		
WBR	WBT	WBL	NBR	NBT	NBL	EBR	EBT	EBL	SBR	SBT	SBL
2002	182	258	351	75	57	49	6	95	300	446	328
2012	222	315	428	92	70	60	7	116	366	544	400
											56

source: PRISM Engineering



Corporate Office: 8365 North Fresno Street, Suite 480, Fresno, California 93720
 voice: (559) 437-1300 fax: (559) 437-1304

MICRO-SIMULATION MODEL RESULTS

We entered the alternative volumes shown in Table 1 for Year 2012 into the VISSIM model created in our original report and ran the simulation to get the traffic operations summary output. In addition to vehicle traffic, 10 pedestrians were assumed to cross E. Main Street SB approach, 10 pedestrians were assumed to cross E. Main Street EB approach, and 10 pedestrians were assumed to cross the Idaho Maryland Road WB approach during the simulation time period (1 hour). This level of pedestrian activity is higher than that observed in the field count of August 28, 2002 (less than five pedestrians). The micro-simulation was run 10 separate times for each of the delay and queue analyses runs using a different random seed for each run. The output values for delay and queue lengths were averaged for each run and reported in this document.

Table 2
30 Second Interval Delay Summary
From VISSIM Roundabout Model, Year 2012

Offramp		Idaho Maryland		E. Main SB		Bypass		E. Main EB	
Delay*	#Veh	Delay	#Veh	Delay	#Veh	Delay	#Veh	Delay	#Veh
6.2	195	8.2	653	11.2	447	4.8	361	18.3	555
LOS A		LOS A		LOS B		LOS A		LOS C	

Source: PRISM Engineering

*all delay shown in seconds

Note: 30 second interval values shown in detail in appendix

As can be seen from Table 2, the average delays shown in the table have a range from 4.8 seconds on the E. Main SB Bypass Lane approach to a high of 18.3 seconds average delay for the E. Main Street EB Approach. These hourly averages are within the LOS C range indicating that the roundabout will operate at satisfactory levels of service well into the Year 2012. Detailed 30 second interval values (120 records in total) were not practical to show in a table, but are reported in the appendix. The average value from the VISSIM software is shown at the bottom of the appendix table. Also shown in the data within the appendix are the number of vehicles entering the Idaho Maryland Ramp for each of the 30 second time intervals (far right column). This column gives some idea of the headways and platoon sizes that will be entering the ramp. For example, the data shows that there is a range of 1 vehicle up to 8 vehicles for each of the simulation intervals. There were four intervals (out of 120) where up to 8 vehicles entered the ramp during a 30 second time period. This translates to a worst-case 3.5 second headway between vehicles taking place four times (8 vehicles x 3.5



seconds = 30 seconds). From the simulation average, 6 vehicles will enter the ramp during a 30 second interval (headway is 6×5 second headway = 30 seconds). A worst-case 3.5 second headway for vehicles traveling at 25 mph onto the ramp creates a distance of 128 feet between vehicles¹. If the average headway of 5 seconds is used (as per the analysis), this distance increases to 183 feet between vehicles entering the ramp. It is important to note that as the speed of the vehicles increases as they accelerate onto the ramp and towards the weave, the distance between the vehicles will also increase as the headway remains constant (the average headway is a known constant from the simulation which had an average of 6 vehicles entering the ramp during any 30 second time period, maximum of 8). If the speed of the vehicles entering the weave area is 50 mph, then the average distance between vehicles would be 367 feet² (using 5 second headway), with the shortest expected distance between vehicles being 257 feet (using a 3.5 second headway). Since the weave area is only 300 feet in length, it is not expected that more than one vehicle will be navigating the weave at any one time. The volume of traffic entering the weave is not aggravated by the roundabout design, but is actually tempered to create an even flow rate. It was observed that the addition of crosswalks helped to reduce delays to the E. Main Street EB approach, as it helped create a few gaps in traffic flows entering from E. Main Street SB and Idaho Maryland Road which tend to limit E. Main Street EB traffic from entering the roundabout.

Table 3 shows the average and maximum queue lengths expected from the same scenario for the hour-long simulation period. The average and maximum queues are well within the existing constraints of the roadway system. It should be noted that because these simulation runs were averaged with 10 runs total, that many of the higher values in our original report were "evened out" with an average value. In the original report we indicated that there was an occasional maximum queue on Idaho Maryland Road of 685 feet (still 400 feet away from the SR 20/49 EB Ramps intersection), but this value has now decreased to a maximum queue length of 137 feet with the averaged values used, as stipulated in this analysis. The hourly average is only 48 feet of queue length. The definition of when a vehicle is "queued" is as follows: Queue begins when velocity is less than 3.1 mph, and ends when velocity is greater than 6.2 mph. What this means is that vehicles are included within the queue even though the vehicles may not even be stopped.

The distance from East Main Street to the SR 20/49 EB Ramps intersection is about 1,100 feet on Idaho Maryland Road. The roundabout maximum

¹ $(5280 \text{ feet/mi}) \times (25 \text{ mi/hr}) \times (1 \text{ hr}/3600 \text{ secs}) = 36.7 \text{ feet/second}$

² $(5280 \text{ feet/mi}) \times (45 \text{ mi/hr}) \times (1 \text{ hr}/3600 \text{ secs}) = 73.3 \text{ feet/second}$

queues for Year 2012 are not expected to reach the ramps intersection on the east side of the freeway.

Table 3
30 Second Interval Queue Length Summary
From VISSIM Roundabout Model, Year 2012

Offramp		Idaho Maryland		E. Main SB		Bypass		E. Main EB	
Queue in Feet		Queue in Feet		Queue in Feet		Queue in Feet		Queue in Feet	
Avg.	Max.	Avg.	Max.	Avg.	Max.	Avg.	Max.	Avg.	Max.
7	28	14	48	22	53	9	41	52	105

Source: PRISM Engineering

Note: detailed 30 second interval values reported in appendix

It was not assumed that Scandling Avenue would relieve Idaho Maryland Road, in order to have a more "worst-case" analysis and to be conservative in estimates of queue lengths. If Scandling Avenue is used by motorists to avoid the occasional queues, then the queue lengths reported in Table 3 would be even shorter for Idaho Maryland Road.

OnRamp Comparative Analysis

Table 4 was prepared to compare the results of projecting the August 28, 2002 PRISM Engineering count out to the Year 2012, with the actual Year 2004 onramp count. A high value for the 4:20 pm time slot was eliminated, and not averaged into the vehicle totals. The five minute intervals were compared between the 2004 and 2012 onramp flows, with the 15 minute totals shown in red. Considering the 2% growth rate for traffic, the differential between the two rows shown in Table 4 is actually less than this 2%, indicating that the roundabout helps lessen the impact.

Table 4
Idaho Maryland Onramp Traffic Flow Comparisons

	4:15 pm	4:20 pm	4:25 pm	4:30 pm	4:35 pm	4:40 pm	4:45 pm	4:50 pm	4:55 pm	5:00 pm	5:05 pm	5:10 pm	Total
Year 2004	60	N/A	47	58	69	42	70	49	64	54	55	76	644
		107			168			184			185		
Year 2012	56	N/A	63	63	65	63	62	64	66	60	67	65	694
		119			191			192			192		

source: PRISM Engineering



The results shown in Table 4 indicate that the roundabout will not worsen the platoon lengths of traffic onto the freeway above and beyond the naturally occurring 2% growth rate that will take place if nothing is done to the intersection.

If you have any questions, please do not hesitate to call.

Sincerely,

Grant Johnson
PRISM Engineering



Corporate Office: 8365 North Fresno Street, Suite 480, Fresno, California 93720
voice: (559) 437-1300 fax: (559) 437-1304

APPENDIX

Supplementary Delay information for each 30 second interval in Roundabout
(average of 10 micro-simulation runs, using different values of random seed each time)

Time secs	Offramp		Idaho Maryland		E. Main SB		Bypass		E. Main EB		ONRAMP	
	Delay	#Veh	Delay	#Veh	Delay	#Veh	Delay	#Veh	Delay	#Veh	Delay	#Veh
30	0.3	1.2	1.03	2.1	0.87	2.3	0.77	2.4	0.86	1.4	0.01	1
60	2.66	1.7	2.47	5.4	4.5	3	2.82	3	5.02	4.5	0.19	5
90	2.74	1	5.91	4.9	8.45	4.2	2.8	2.9	5.35	4.4	0.07	6
120	2.94	1.9	5.08	5.6	7.87	3.6	3.65	3.9	12.49	3.9	0.07	7
150	2.29	1.2	4.9	5.8	10.8	4.4	4.22	2.7	12.87	3.4	0.12	7
180	3.11	1.8	3.35	4.8	6.51	3.2	3.21	2.9	15.76	5.6	0.09	6
210	4.75	2.1	8.05	4.7	9.48	4.2	4.22	3.3	10.44	4.4	0.09	5
240	3.26	1.4	8.9	5	10.44	3.6	2.75	2.6	12.51	4.8	0.09	7
270	3	1.6	6.86	5.6	6.53	3.7	5.37	3.4	10.28	4.9	0.07	6
300	3.34	1.7	7.42	5.3	11.11	4.6	6.38	3.7	10.65	4.6	0.12	6
330	1.95	1.5	6.5	6.3	16.16	3.2	6.25	3.7	7.85	4.3	0.18	6
360	3.78	1.5	6.19	5.7	16.53	4.1	5.68	3	8.63	4.8	0.06	6
390	3.85	1.4	5.74	5.7	14.54	3.8	3.33	2.3	11.15	4.1	0.1	7
420	4.49	1.6	4.83	5.6	10.32	4.4	3.89	3.1	11.92	4.6	0.09	6
450	4.75	1.4	4.16	4.9	4.65	4.3	2.93	2.5	15.41	5.1	0.11	7
480	7.1	2.2	7.9	4.5	3.97	3.5	4.67	2.3	14.24	5	0.07	6
510	4.96	1.7	9.85	6.3	3.87	2.9	5.44	4	11.82	4.2	0.1	7
540	6.39	1.8	9.95	6.3	7.76	3.6	2.57	3	18.77	4.4	0.08	8
570	3.44	1.3	6.72	4.7	6.13	4.2	3.27	4.3	20.39	5.1	0.04	6
600	4.58	1.4	6.59	4.6	7.71	4.7	6.09	3.9	21.7	5.1	0.08	7
630	7.74	1.9	9.38	4.8	3.6	3.1	2.05	2.6	19.46	4.9	0.07	6
660	3.93	2.4	13.82	4.8	6.59	3.6	3.87	2.7	15.76	5.1	0.07	6
690	4.42	2.1	10.51	5.4	9.41	4.2	2.18	2.4	12.91	4.2	0.07	7
720	6.75	1.9	9.34	5.8	8.47	3.4	2.77	4.1	15.22	5.4	0.01	5
750	8.1	2.4	13.5	4.5	12.46	4	2.69	3.6	12.66	5.2	0.1	5
780	5.19	2.4	12.45	6.7	14.8	3.3	3.31	2.6	15.19	3.6	0.16	7
810	2.87	0.9	9.15	5.8	10.92	3.4	4.49	2.4	16.67	5.6	0.03	7
840	4.72	1.6	9.27	6.2	9.62	3.6	4.5	2.8	14.07	4.2	0.06	6
870	3.13	1.9	5.7	5.2	14.45	4.5	8.51	3.1	11.68	3.7	0.05	7
900	4.23	1.8	4.04	5.7	15.19	4.8	3.81	3.3	11.93	4.1	0.11	7
930	4.79	1.9	3.94	5.5	12.31	4.1	5.46	3.1	15.05	4.3	0.06	7
960	3.97	1.4	3.18	4.2	9.88	4.7	2.94	3.2	20.03	4.4	0.15	7
990	4.18	1.2	3.53	6.5	7.62	3.9	5.45	2.2	22.09	4.2	0.14	7
1020	4.11	1.2	4.61	3.6	5.03	4	3.28	3.4	20.85	5.6	0.08	7
1050	10.27	2.3	10.09	4.9	4.12	3	2.34	3	13.5	5	0.07	5
1080	3.52	1.3	10.3	6.9	9.57	2.7	3.07	2.6	8.79	3.6	0.07	7
1110	3.85	1.5	8.4	6.1	16.03	3.5	5.07	3.2	13.4	5.1	0.04	6

1140	3.3	1.5	6.79	5.1	15.9	3.3	4.25	2.2	12.45	5.2	0.08	5
1170	6.84	1.5	7.55	5.7	14.77	3.8	2.47	3	12.89	3.9	0.14	7
1200	5.71	1.9	4.34	5	12.95	3.6	7.3	2.5	16.43	4.5	0.07	6
1230	5.55	1.2	3.94	5	12.01	4.1	5.15	2.7	16.56	4.2	0.03	6
1260	6.45	1.5	3.97	4.7	12.32	3.5	5.6	3.1	19.23	4.8	0.09	6
1290	6.96	2.2	4.08	5.7	15.03	3.8	2.52	3.4	20.3	3.5	0.11	6
1320	1.91	0.9	4.41	4.2	15.3	3.2	4.78	3.4	24.86	6.3	0.15	6
1350	7.32	1.8	7.32	5.4	11.96	4.9	4.08	2.9	23.42	4.5	0.08	8
1380	7.58	1.9	4.61	4	9.82	3.6	4.49	4.1	29.19	6.6	0.08	6
1410	3.52	1.7	8.58	5.5	11.14	3.8	1.84	2.7	23.76	5.3	0.13	7
1440	8.01	1.7	6.64	7.2	14.05	3.3	2.83	2.3	25.21	4.9	0.07	7
1470	5.2	1.9	4.27	5.4	18.62	4	4.55	3.8	27.95	4.6	0.09	7
1500	6.77	1.5	5.46	5.6	16.51	4.3	5.96	3.1	22.94	5.2	0.07	7
1530	5.68	2.2	6.12	4.2	11.97	4.6	2.95	3.2	24.21	4.9	0.12	6
1560	2.22	1.7	5.98	5.5	9.04	3.2	3.07	2.9	25.59	4.9	0.04	6
1590	4.06	1	8.25	5.9	12.16	3.6	3.29	3.1	22.26	5	0.11	7
1620	4.6	2	7.84	5.5	10.26	4.1	4.48	3	20.81	4.4	0.21	5
1650	5.26	1.5	12.3	7.2	4.87	3.3	4.2	3.1	19.19	4.2	0.06	7
1680	4.77	1	7.48	5.4	9.21	3.8	3.56	3.1	27.35	4.2	0.11	7
1710	2.3	1.8	5.67	5.9	15.18	3.8	5.87	2.1	26.6	3.4	0.07	6
1740	5.23	1	4.83	5.6	13.61	2.9	5.91	3.4	23.68	5	0.1	7
1770	7.5	1.5	7.33	4.1	12.26	3.5	4.15	3.1	16.54	6.2	0.07	5
1800	5.13	1.6	10.03	5.3	7.37	3.4	2.98	2.2	10.39	5.6	0.09	7
1830	4.41	1.9	6.12	7	13.88	2.8	4.59	2.5	8.76	3.5	0.1	6
1860	2.8	1.5	2.81	4.5	12.67	4.2	6.15	3.6	5.84	4.1	0.16	7
1890	5.82	1.9	4.62	5.9	10.42	2.7	5.01	2.2	9.29	4.8	0.1	6
1920	2.71	1.9	7.31	4.7	13.23	4	4.48	2.3	10.64	4	0.04	6
1950	4.25	1.8	6.53	6.8	9.76	3.8	3.49	2.9	11.41	3.4	0.09	6
1980	4.5	2	5.73	4.9	9.13	3.6	5.96	2.9	10.24	4.8	0.08	6
2010	4.55	1.9	8.09	6.2	8.67	3.3	4.47	2.6	10.84	4.2	0.09	6
2040	3.38	2.3	8.08	6.5	11.55	3.4	6.4	3.1	14.2	3.7	0.06	6
2070	2.43	1.1	8.85	6.1	12.01	3	7.28	3.5	13.94	4.7	0.01	6
2100	3.53	1.1	5.52	5.7	11.31	4	3.68	2.6	17.71	3.6	0.12	6
2130	4.24	1.7	7.5	6.1	6.49	3.7	1.88	3.1	17.96	4.7	0.08	7
2160	2.21	1	9.08	5	7.1	3.2	2.26	2.7	20.28	6.3	0.02	6
2190	4.48	2	8.46	5.1	9.21	3.8	4.14	3.2	14.9	4.8	0.1	6
2220	3.82	1.9	8.57	5.3	14.23	4.4	3.89	3.1	17.01	4.7	0.12	7
2250	5.45	1.9	9.05	5.3	9.91	4.1	5.9	3.3	21.77	4.6	0.16	7
2280	4.94	1.1	8.45	5.9	6.93	3.5	3.25	2.7	20.11	4.7	0.1	6
2310	3.24	1.4	7.41	4.3	7.57	4.3	4.18	2.4	18.69	5.3	0.07	7
2340	3.8	1.8	8.14	4.8	7.28	4.7	3.19	3.4	19.57	4.8	0.05	6
2370	3.27	1.6	9.31	6.4	6.64	2.7	4.82	3.8	22.79	4.1	0.04	7
2400	3.19	1.4	7.66	5.2	9.91	3.6	3.21	4.2	22.53	4.6	0.12	7
2430	3.98	1.4	5.14	5.7	10.62	3.3	3.29	4.4	23.8	5.3	0.06	6

2460	4.57	1.9	8.33	5.8	12.35	4	4.15	2.5	18.85	5.5	0.09	5
2490	7.71	1.4	9.8	6.2	14.1	3.2	7.53	4.2	22.71	4.7	0.04	7
2520	6.93	1.7	10.47	5.9	15.26	4.6	4.99	3.1	21.83	5.4	0.14	7
2550	5.39	1	5.48	6.6	15.81	4.7	4.59	3.2	27.99	3.1	0.06	8
2580	3.2	1.5	5.72	5	6.94	4.1	4.64	2.8	28.91	5.5	0.19	7
2610	2.01	0.9	9.92	5.8	8.42	2.7	2.56	4.1	26.01	5.2	0.03	6
2640	6.61	1.7	7.89	5.2	11.88	3.8	1.37	2.1	26.88	5	0.12	7
2670	6.64	1.3	10.34	4.3	5.8	4.1	3.21	3.2	28.41	5.9	0.19	6
2700	6.52	2	15.08	5.1	4.41	3.6	3.3	2.7	18.74	5.4	0.1	6
2730	8.61	2.5	17.21	5.4	7.9	3.4	4.15	2.8	12.14	4.6	0.08	6
2760	5.3	1.4	11.5	5.5	7.77	3.2	3.2	3.2	9.16	5.6	0.18	6
2790	5.75	1.5	11.99	5.7	10.18	3.8	4.45	2.9	14.4	4.3	0.07	6
2820	10.88	1.6	15.29	5.9	10.88	3.6	4.4	3.1	14.94	4	0.06	6
2850	6.53	1.8	12.91	6	9	2.6	3.33	3.3	16.61	4.6	0.13	6
2880	3.68	1.3	10.6	5.6	5.75	3.8	4.06	2.6	17.58	4.4	0.07	6
2910	3.75	1.4	8.46	5.9	10.61	3.4	4.3	2.7	17.33	3.9	0.06	6
2940	5.32	1.5	7.15	4.7	6.91	4.1	3.16	2.5	10.56	5.3	0.08	7
2970	4.09	2.1	7.07	5.6	6.68	3	3	2.6	14.18	4.6	0.06	6
3000	2.58	1.4	9.26	5.8	9.77	4.7	5.16	2.9	12.41	4.8	0.06	6
3030	4.37	1.3	7.18	5.6	6.89	4.1	3.73	2.6	17.14	4.2	0.11	8
3060	4.17	1.6	9.2	6	6.41	3.4	5.45	3.1	20.71	4.9	0.08	7
3090	4.25	2.1	10.07	4.7	5.17	3.5	3.46	2.4	16.74	5.7	0.06	6
3120	4.57	1	9.62	6	5.3	3.2	3.89	2.6	12.46	4.6	0.05	7
3150	2.55	1.5	5.25	4.3	5.83	5.3	4.37	2.3	13.43	4	0.12	7
3180	7.13	1.6	4.28	5.9	6.18	3.9	3.23	3.2	12.93	4.5	0.07	7
3210	4.3	1.8	4.49	5.7	9.12	3.5	4.87	3.6	18.25	4.7	0.09	7
3240	5.44	1.9	6.87	4.6	7.64	3.9	3.33	3	13.32	4.3	0.15	6
3270	3.32	1.7	5.76	5.7	8.15	3.2	4.86	2.5	13.1	4.2	0.06	7
3300	3.62	1.8	6.03	6	9.05	3.4	4.17	3.1	11.73	4.3	0.07	7
3330	4.43	1.3	5.52	4.9	9.41	4.8	2.63	2.5	11.8	4.2	0.11	7
3360	4.97	1.6	6.24	5.8	7.35	3.1	3.65	3	17.92	4.4	0.1	6
3390	5.7	1.6	8.31	6.1	8.19	3.6	3.85	2.8	17.82	5	0.06	6
3420	7.19	1.9	10.07	4.3	10.39	4.9	2.53	2.3	15.29	4.7	0.08	6
3450	5.16	1.9	3.89	5.2	9.16	3.5	2.61	2.7	21.82	4.7	0.15	7
3480	2.21	1.1	6.81	5.4	8.51	4.1	3.35	3.3	18.99	3.5	0.14	6
3510	3.99	1.7	6.08	6.1	8.95	3.7	3.33	3.6	23.27	4.3	0.13	7
3540	4.44	1.7	7.7	5.8	12.44	3.6	3.78	2.9	22.26	5.5	0.2	7
3570	3.33	1.2	7.66	6.7	11.04	3	4.52	4.2	20.5	4.3	0.08	7
3600	2.34	1.8	10.02	5.5	11.6	4.5	1.92	2.2	19.43	4.5	0.19	7
TOTALS	6.17	194.6	8.21	653.2	11.16	447.4	4.75	360.5	18.29	555.1	0.1	759

Supplementary Queue Length information for each 30 second interval in Roundabout
(average of 10 micro-simulation runs, using different values of random seed each time)

	Offramp		Idaho Maryland		E. Main SB		Bypass		E. Main EB	
	Queue in Feet		Queue in Feet		Queue in Feet		Queue in Feet		Queue in Feet	
Seconds	Avg.	Max.	Avg.	Max.	Avg.	Max.	Avg.	Max.	Avg.	Max.
30	0	0	0.1	1.8	0	1.6	0	7.9	2	13.8
60	2	17.9	1.4	22.6	8.1	26.2	6.3	25.6	6	34
90	2	23.1	9.2	39.1	21.7	50.7	5.2	41.7	6.9	25.4
120	3.2	25.3	2.2	41.8	16.8	59.9	9.7	43.7	38.9	80.2
150	3.1	11.6	3.2	20.2	19.3	64.8	6.3	42.6	48	100.9
180	5.2	25.1	3.6	22.5	13.2	40.9	6.5	27.5	62.3	123.1
210	8.1	34.3	19.7	55.3	31.9	64.4	8.5	47.8	16.7	58.5
240	4.7	31	35	72.2	12.1	48.1	3.9	34.4	29.7	71.3
270	1.5	18.5	47.4	84.8	10.2	37.2	19.1	75.2	13.9	60.9
300	4	21	3.9	27.7	43.7	84.1	17	72.6	19.7	58.4
330	1.9	18	3.1	30.4	33.9	82.8	21.2	47.4	9.5	34.5
360	2.1	9.1	5.1	38.5	48.9	78.6	5.7	52.5	16.1	57.4
390	4.4	25.6	2	22.6	29.4	66.1	14	46.2	27.5	66.1
420	9.3	43.1	4.5	24.6	23.3	51.7	7.5	30.8	22.7	74.6
450	4.2	23	1.4	20.2	2.1	15.9	10.1	32.9	39.8	92.2
480	9.8	36.5	6.6	28.2	1.2	13.4	16	45.5	25.9	77
510	6.8	31.4	7.7	41.4	6.6	31.8	11.1	51.9	29.4	76.2
540	6.4	36	12.3	59.7	13.7	43.4	6.9	49.4	67.4	122.4
570	3.7	18.5	5.9	24.7	11	36.2	5.5	44.3	69.7	140.7
600	13.4	35.1	9.2	38.9	7.6	39	14.4	64.9	55.9	128.2
630	13	25.2	15.7	49.6	2.9	14	0.9	8	52.8	118.8
660	5.2	23	35.3	89.1	9.6	44.5	6.5	29.8	34.8	97
690	6.1	22.9	12.4	53.5	17.6	49.3	2.7	30.8	47.9	95.8
720	17.2	59.1	11.3	45.6	18.2	48.6	2.5	31	52.3	100.7
750	6.7	43.4	42.2	123.4	24.6	50.5	1.8	23.1	22.1	65.5
780	7.3	39.9	38.1	121.1	19.9	52.8	6.2	28	44.9	82.5
810	1.7	22.9	13.8	50.3	23.3	48.3	8.6	36.5	53.6	108.8
840	6	30.9	13.1	39.6	39.3	73	14.9	56.2	22	81.4
870	3.1	25	1.7	29.7	45.2	79.4	22.7	81.8	29.3	73.6
900	4.8	30.5	2.1	22.6	37	75.6	11.8	44.3	24.9	76.8
930	6.1	33.1	3.8	31.3	19.4	55.7	13	53	62.7	116.6
960	4.5	18.4	2.2	20.6	15.7	46.3	3.4	27.8	48.3	108.1
990	6.3	34	7.8	32.4	8.6	42.6	10.6	22.1	79.2	145.8
1020	7.6	32.2	6.8	29.5	3.6	21.4	2.8	25.1	61.5	145.1
1050	19.1	56.9	20.9	54.9	20.2	50.3	4.4	36.4	20.7	70
1080	3.9	20.8	4.4	28.4	41	70.3	12.4	44.3	30.3	67.2
1110	6.6	17.9	4.8	24.3	60.4	100	13.5	38.5	37.6	95

1140	4.1	27.9	10.1	45.9	69.9	92.7	12.4	35.3	25.5	78.2
1170	6.4	37.1	9.7	46.9	29	64.1	5.7	27.6	55.1	98
1200	8.5	28.7	2.3	15	54.1	84.1	25.7	79.8	70.8	128.3
1230	5.7	30.6	2.3	17.4	45	77.3	12.1	39.8	70.1	126.7
1260	17.6	39.7	2.4	10.4	38.9	59.7	6.2	39.3	67.8	115.6
1290	10.3	41	3.3	24	22.4	63.4	6.6	63	85	119
1320	3.6	17.8	5.3	28	49.1	66.2	15.9	37	101.8	173.4
1350	20.9	46.6	8.6	46.6	37.6	67.4	3.8	30.5	112.5	207
1380	4.7	31.2	13.8	50.8	37.4	69.6	7.6	43.7	133.8	230
1410	12.9	46.3	20.6	58.1	28.5	75.8	1.1	7.6	97.7	199
1440	12.5	38.3	4.4	16.2	41.4	73.6	10	49	106.6	180.4
1470	5.8	32.4	3.7	27.3	47.8	92.6	8.5	56.4	98.7	161.4
1500	12.9	26.6	2.9	28.1	46.6	81.7	15.6	42	69.1	122
1530	3.6	32.1	2.5	16.8	26.5	58.6	8.1	41.2	80.8	136.9
1560	2.2	9.2	4.7	23.1	18.3	48.2	6.3	51.1	75.4	154.9
1590	3	11.7	11.2	38.7	21	60.2	5.2	50.3	75.7	149
1620	8.9	32.1	40.7	106.2	15.2	42.6	14.9	80.8	53.1	113.6
1650	4.6	29.9	27	79.3	5.7	26.4	6.1	41.4	59.5	111.7
1680	4.9	25.7	11.1	32.2	28.3	62	5.6	27.5	76.4	122.5
1710	2.6	12.2	18.3	28.2	33.5	69.4	25.1	56.9	101	136.3
1740	6.3	25.6	5.1	26.5	46.5	81.9	10.3	50	98.4	156.3
1770	12.9	37.4	27.5	46.8	44.6	63.5	6.9	27.4	39.9	126
1800	11.3	42.5	28.8	75.9	7.2	32.1	10.7	36	19.5	65.8
1830	2	18.7	2	22.9	26.2	70.2	15.4	60.9	18.1	44
1860	4.5	19	3.1	18.5	42.3	74	18.9	66.1	9	35.2
1890	4.5	31.9	2.9	21.8	32.5	68.3	7	45.2	21	69.6
1920	1.4	13.9	20.4	62.7	29.7	60.2	14.9	45.3	27.3	61.2
1950	5.1	35.3	4.2	41.5	12.2	39.4	7.4	31.2	14.3	49.3
1980	5.8	29.7	4.9	25.1	9.1	25.8	17	51	27.1	60.4
2010	4.2	21.5	10.5	52.1	18.7	51.5	15.9	31.8	33.3	77.9
2040	3.8	27.6	37.8	94.6	14.8	45.3	29.2	73	32.5	65.3
2070	3	16.2	20.5	79	27.3	79	14.7	70.6	18	61.2
2100	3.2	26	10.8	50.3	17.3	69.5	4.6	18.3	51.9	96.4
2130	5.6	20.5	11.4	44.2	8.5	34	0.7	15.1	55.1	119.8
2160	2.6	23.2	8	56.2	14.5	38.6	3.5	32.2	60	120.4
2190	6.7	23.6	30.6	71.1	23.5	65.5	9.9	35.6	41.1	84.8
2220	5.7	28.4	26.2	104.8	27.5	66.7	15.4	58.3	47.3	95.4
2250	4.9	24.6	13.2	54.7	11.2	45.3	16.6	47.9	63.8	141.7
2280	3.3	22.4	9.7	40.3	9.4	41.9	1.2	27.6	65.2	131.9
2310	4.6	18.6	4.9	41.2	17.4	50.1	7.8	29.6	52.8	119.7
2340	4	19	7.3	42.6	7.3	27.1	8.7	52	66.8	133.1
2370	0	0	30.2	88.1	16	44.5	8.2	53.1	73.3	137.8
2400	1.6	18.1	24.1	83.4	20	52	5	33.8	108.3	153.5
2430	7.9	20.9	2.9	22.2	25.6	52.7	1.9	23.3	73.1	165.3

2460	7.1	36.6	14.9	49.7	32.8	66.9	17	51.7	53.5	122.1
2490	9.6	44.4	23.9	78.3	42.8	74.4	19.1	68.9	61.9	118.6
2520	8.8	37.2	23.3	52.7	51	93.5	7.4	29.4	61.7	112.5
2550	4.4	26.5	10.9	52.3	18.6	61.9	7.2	50	104.1	149.1
2580	2.6	17.9	9.4	52	12.4	31.6	10.1	40.2	113.2	170.7
2610	1.2	7.3	29.2	72.7	24.2	60.1	2.3	17.8	77.2	146.4
2640	14.6	41.2	4.9	33.7	18	62.3	4.1	26.2	118.5	194.8
2670	16.9	33.6	11.9	34.3	3.8	27.1	5.6	26.1	106.5	181.5
2700	20.1	46.6	38.1	100.4	4.5	21.2	8.4	46.7	41.5	120.4
2730	22	42.5	41.1	137.1	11.1	39.6	2.4	27.3	26.5	79.9
2760	13.6	27.8	66.4	94.2	16.6	42.1	2.6	41.6	23.9	77.7
2790	18	28	33.7	119.8	27.5	48.8	6.9	65.5	40.3	74.9
2820	16.6	48.9	27.3	82.8	12.7	46	6.3	35.2	44.2	85.1
2850	14.4	42	81.9	139	18.6	46.6	5.7	41	59.8	101.9
2880	3.7	33.5	8.3	70.3	15.7	44.9	7.5	46.3	45.1	87.4
2910	6.1	19.3	5	35.1	22.4	46.8	11.7	44.6	18.6	67.3
2940	8.3	34.3	3.6	24.5	9.7	42.7	4.4	23.3	30.5	76.2
2970	4.9	22.9	11.9	54.8	12.9	35.9	11.4	55.1	47.7	98.3
3000	5	23.6	26.2	92	20.2	49.4	17.2	65	28.1	79.4
3030	7.4	18.7	6.3	45.7	12.4	38.2	4.9	28.3	72.6	122
3060	3.4	25.9	25.6	74.3	7.6	27.3	12.9	53.1	71.7	134.3
3090	6.7	21.1	21.4	95.7	4	22	2.4	17.7	52.9	136.6
3120	3	22.7	26.5	84.3	7	31.2	11.2	38.6	22.3	65.6
3150	6.8	24.6	2.9	16.6	6.5	28.7	7.9	25.6	22	60.9
3180	8.8	36.8	2.8	24.4	13.3	30.6	9.2	29.4	32.1	75.8
3210	5.2	30	2.3	18.7	26.1	56.5	12	32.6	51.9	94.2
3240	6.7	40.3	5.6	28.1	20.8	51.7	4.4	26	17.2	80.5
3270	5.7	37.8	4.3	32.6	20.9	46.8	14.1	69.3	19.5	61.9
3300	4.3	30.6	9.5	41.6	15.8	46.3	5.9	45.2	27.3	58.4
3330	11.1	27.2	28.1	64.9	15.3	47.8	2.7	33	36.5	94.3
3360	5.9	23.9	2.7	20.5	12.5	34.8	2.9	48.2	73.8	125.8
3390	7.6	36.5	7.2	33.5	12.7	46.7	9.3	48.6	48.8	100
3420	9.4	40.6	10.3	38.6	27.4	61.5	5.7	28.6	49.1	84.4
3450	8.1	32	1	12.6	17.1	56.5	7.3	51.1	66.6	116.5
3480	1.4	9.5	27.3	57.3	18.3	56.1	3.4	25.3	67.7	117.5
3510	6.6	25.9	5.4	41	25.3	57.7	3.6	30.4	88.2	127.8
3540	4.1	28.8	3.8	32.2	21.7	61.2	10.1	33	87.4	139.7
3570	1.5	13.8	3.3	27.9	25.5	59.6	9.9	53.5	71.6	109.2
3600	1.4	8.9	22.9	48.7	24.7	58.8	1.7	15.4	82.7	123.7
AVG FEET	7	28	14	48	22	53	9	41	52	105